REMARKS

This application has been carefully reviewed in light of the Office Action dated December 11, 2008. Claims 1-3 and 5-12 remain in this application. Claim 1 is the independent Claim. Claim 1 has been amended. Claim 4 has been canceled, without prejudice. New Claims 8-12 have been added. Support for the amended and new claims is found in Applicant's Specification at Page 12, lines 13-14, Page 28, lines 9-10 and the Examples. It is believed that no new matter is involved in the amendments or arguments presented herein.

Reconsideration and entrance of the amendment in the application are respectfully requested.

Art-Based Rejections

Claims 1-5, and 7, were rejected under 35 U.S.C. §103(a) as obvious over JP 2003-243676 (Tawada) in view of Non-Patent Publication "*Influence of Substrate Texture on Microstructure and Photovoltaic Performances of Thin Film Polycrystalline Silicon Solar Cells*" (Matsui); Claim 6 was rejected as obvious over Tawada in view of Matsui and U.S. Publication No. 2003-0116185 (Oswald).

Applicant respectfully traverses the rejections and submits that the claims herein are patentable in light of the clarifying amendments above and the arguments below.

The Tawada Reference

Tawada is directed to a thin-film photoelectric converting device including a thin film 10, transparent electrode 11, conversion unit 12 and reverse electrode 13 *(See Tawada; Abstract)*.

The Matsui Reference

Matsui is directed to a reflective, textured ZnO/Ag/SnO_2 substrate having a RMS roughness of 38 nm *(See Matsui; Abstract and Page 1153)*.

The Oswald Reference

Oswald is directed to a sealed photovoltaic module *(See Oswald; Abstract).*

The Claims are Patentable Over the Cited References

The present application is generally directed to a substrate for thin film solar cells.

As defined by amended independent Claim 1, a substrate for thin film solar cells consists of a transparent insulating substrate and a transparent electrode layer including at least zinc oxide deposited on the transparent insulating substrate. The transparent insulating substrate has a fine surface unevenness having a root-mean-square deviation of the surface of 5 to 50 nm in an interface by a side of the transparent electrode layer, and a projected area consists of a curved surface. The transparent insulating substrate consists of a stacked layer of a transparent base material having a smooth surface, and a transparent foundation layer. The transparent foundation layer includes transparent micro-particles having an average particle diameter of not less than 10 nm and less than 100 nm, and a transparent binder.

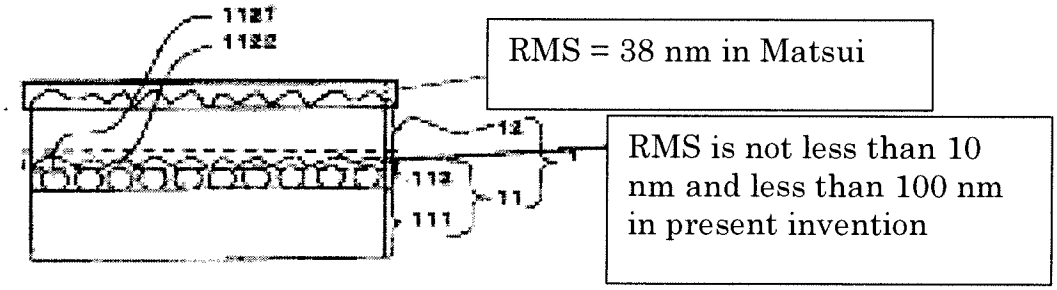
The applied references do not disclose or suggest the features of the present invention as defined by amended independent Claim 1. In particular, the applied references do not disclose or suggest, "the transparent insulating substrate has a fine surface unevenness having a root-mean-square deviation of the surface of 5 to 50 nm in an interface by a side of the transparent electrode layer," as required by amended independent Claim 1 of the present invention.

Page 3 of the Office Action concedes that Tawada fails to disclose or suggest an unevenness having an RMS deviation of the surface of 5 to 50 nm. However, the abstract of Matsui is asserted to teach this feature of a transparent, textured substrate with the root mean square roughness σ of 38 nm. We respectfully disagree.

Matsui discloses in the Experimental section of page 1153, a reflective $ZnO/Ag/SnO_2$ substrate that is not a transparent insulating substrate. The teaching of

textured substrates having improved performance at σ = 38 nm applies only to reflective substrates since experimental results based on transparent substrates are not disclosed or suggested. At best, Matsui teaches textured ZnO/Ag/SnO_2 reflectors incompatible with Tawada's thin film 10 *(See Matsui; Page 1155, Section 4: Discussion)*. Applicant notes that under M.P.E.P. § 2141.02, the reference must be considered in it's entirety, including disclosures teaching away from the claims. Thus, the surface roughness disclosed by Matsui is relevant to a non-transparent, reflective substrate.

Furthermore, Matsui's textured substrates are disposed on a backside of the solar cell. In other words, they are opposite to the light incident side and have a function of a reflective layer. Tawada merely teaches a textured transparent substrate disposed on the light incident side of the cell. Thus, modification of Tawada to include Matsui's textured layer would not make sense. Furthermore, Matsui teaches an RMS value of 38 nm on the ZnO layer and not on a transparent foundation layer below the ZnO layer. A clarifying figure is provided below.



In contrast, the present invention requires the transparent insulating substrate to have a fine surface unevenness having a root-mean-square deviation of the surface to be 5 to 50nm in an interface by a side of the transparent electrode layer. This feature provides the benefit of a substrate for thin film solar cells having a large light trapping effect. The substrate further increases power generation of electric current and

improves performance of the thin film solar cell by providing a substrate having high photoelectric conversion efficiency at low cost *(See Specification; Paragraph [0116])*.

Moreover, the applied references do not disclose or suggest, "the transparent insulating substrate consists of stacked layer of a transparent base material having a smooth surface, and a transparent foundation layer, and the transparent foundation layer comprises transparent micro-particles having an average particle diameter of not less than 10 nm and less than 100 nm, and a transparent binder," as required by amended independent Claim 1 of the present invention.

Tawada teaches away from the average particle diameter of less than 100 nm. In particular, paragraph [0028] of Tawada discloses:

> The average particle diameter is in the range of from 0.1 to 1.0 μm. Said range corresponds to the main wavelength of the solar light, which is the range of from 400 to 1200 nm. The average particle diameter of less than 0.1 μm or more than 1.0 μm is not preferable, because it reduce the effect of lengthening the light path, and the absorbance of the light will be deceased. (emphasis added).

Therefore, Tawada would not be modified to include the average particle diameter of less than 100 nm, since such a modification would change the principle operation of Tawada and would render the invention unsatisfactory for its intended purpose (M.P.E.P. § 2143.01).

In contrast, the present invention requires the transparent foundation layer comprises transparent micro-particles having an average particle diameter of not less than 10 nm and less than 100 nm. As discussed above, a result of larger unevenness in a transparent electrode layer could not be expected from Tawada. It was surprisingly found out by the present inventors that formation of a foundation layer having a small particle diameter may enable deposition of a transparent electrode layer having a larger

unevenness thereon, although unevenness of the foundation layer itself is small *(See Specification; Paragraph [0020])*. Furthermore, an effect of larger unevenness could not be expected from Matsui, since Matsui is silent with regards to the interface of the transparent electrode layer and its average particle diameter.

Thus, Tawada and Matsui does not disclose or suggest this feature of the present invention as required by amended independent Claim 1.

Since the applied references fail to disclose, teach or suggest the above features recited in amended independent Claim 1, those references cannot be said to anticipate nor render obvious the invention which is the subject matter of that claim.

Accordingly, amended independent Claim 1 is believed to be in condition for allowance and such allowance is respectfully requested.

The remaining claims depend either directly or indirectly from amended independent Claim 1 and recite additional features of the invention which are neither disclosed nor fairly suggested by the applied references and are therefore also believed to be in condition for allowance.

Conclusion

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (310) 785-4721 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
HOGAN & HARTSON L.L.P.

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